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SCHOOL AND SOCIETY

Volume V SATURDAY, JANUARY 13, 1917 Number 107

CERTAIN IDEALS IN EDUCATION[1]

EVERY one who is interested in social betterment is often disappointed and sometimes amazed by the lack of regard for even the most obvious measures for the welfare of mankind. The slowness of people to appreciate and adopt proposals for their own good and that of their posterity is due to their clinging to the usages of their fathers.

We have a tradition that everything in human form is holy and that every man and woman has a right to marry and bring more human beings into the world, no matter what the character of their offspring is sure to be. We have the habit of caring tenderly for the halt, maimed and blind, the mentally defective and all those in want and misery, and we have institutions public and private for the care of the insane, the feeble-minded and other defectives. Have you all visited the state institution for the feeble-minded at Faribault? If not, let me advise you to take the first opportunity to do so. It is the duty of every American to know the facts in this matter. Go to Faribault and see the hundreds of human creatures—mentally and often physically deficient, really part-human-beings—brought into the world by defective parents, with the license of the state and the blessing of the church. Go to Faribault and see those hundreds cursed with an existence which at best in state hospitals is a vague and meaningless existence, and in natural conditions is unthinkable misery and suffering. Then realize that the character of every one of these was foreordained by the inexorable laws of nature and that the way to prevent the birth of the great majority of such defectives has been clearly shown by biological science in recent years. You will then see that while following the example and injunction of the lowly Nazarene to care for the sick and distressed we have failed to realize that we as a people are responsible for producing the whole class of those who before their birth are doomed to lives of imbecility, wretchedness and crime. Do not misunderstand me. I do not criticize the building of hospitals or care and kindness to the defective classes. I say that it would be a thousand times more sensible not to bring them into the world, and that science has fully informed us that the evil can be remedied. Under these circumstances we of the present generation are responsible for the living deaths of those mentally defective of the following generations who are born of known defective parents.

Another of our public institutions is the school system. We have a tradition that every child has an equal right to education at public expense and that the American public school places all positions of honor and power, even the presidency itself, within the reach of the child of the humblest citizen. How unfounded the latter tradition is, is seen from the fact that two of our most notable presidents had practically no formal schooling, either public or private. Another of our traditions is the supposed distinction between the "common people" and some higher classes. The

[1] A brief address at the opening convocation of the University of Minnesota Summer Session, June 18, 1916.

most noteworthy thing, however, is that the "common people" have produced some of the most uncommon of our merchants, manufacturers, philanthropists, statesmen, and presidents, and without the aid or encouragement of the classes above them. It is time for us to realize that the only real distinction among people is between those with brains, capability and the will to strive for their ideals, and those without these endowments. The common people are not those whose parents are possessed of little wealth and social position and social graces, but those whose parents have endowed them with little mental, moral or physical power. In any form of society the uncommon individuals, however high or low their birth, distinguish themselves among their fellows. In an ideal society, public institutions should give to uncommon men the opportunity to make the most of their natural powers. The public school system, if it is to serve the highest good of the state, should develop to the utmost the child possessed of uncommon faculties, while not neglecting to do the same for those of common faculties.

Is it, then, true that every child has the same right to education at public expense? Yes, *so far as his natural faculties enable him to profit by it.* I have space to remark on only one general aspect of this question, namely, the treatment of the more or less capable pupils. We have in our schools all grades of pupils, from the most capable to some who really belong in the class of feeble-minded. Our courses of study are organized for the average pupils or those a little below the average. The work of the eight grades can readily be done by the best pupils in four or five years. Occasionally the brightest pupils are promoted more rapidly than their classes. This is all that is done to encourage or develop the most capable children. Certainly one fourth of the pupils dawdle away their time, form bad mental habits and have their moral stamina undermined while waiting for the less capable pupils to do the required work. On the other hand, great efforts are being made in behalf of the deficient and retarded pupils. Our sense of fair play, our pity for the weak, our care for those less able to care for themselves, urge us to these efforts. But is it sound policy? Is it right to give all our efforts to try to bring the retarded and deficient children up to the common level, while we allow the bright, the strong, the courageous, to fall back to the same level for lack of guidance and opportunity to use and develop their powers? "This ye ought to have done and not to have left the other undone."

What have we left undone? Chiefly real education; book-learning enough has been provided. It is not advantageous simply to allow the bright pupil to go through the grades more rapidly. He should have during the years of the grade school more real education. He should have experience in practical work, he should test his powers and discover the work for which his faculties fit him, and he should be prepared for and introduced to that work with the least waste of misdirected effort and with the greatest possible development of his inborn faculties. All this means agriculture, trades, manufacturing, commerce under the direction of the schools and the serving of true apprenticeships by the pupils. The movements toward liberalizing the public-school curriculum, including the schools of manual and domestic arts and the vocational schools, indicate that this is to be accomplished in the not far distant future. In these activities and opportunities the uncommon pupil will find chance for the development of his powers.

It has been my business for many years

to study the structure and physiology of the brain and nervous system. One result of that study brings the strongest scientific support to the contention here made. It is a fact that the growth and development of nerve cells and fibers is strongly influenced by the activities of the young animal or child. If the animal is confined and its activities restricted within narrow bounds, the nerve paths which are necessary for the performance of more complex activities would never be developed. If so inhuman an experiment were possible, it would be found that a babe kept in a bed for twenty-one years with light, air and food, but without action, knowledge of objects or people, would be a hopeless imbecile, unable ever to become a man, because the necessary cells and fibers in his nervous system had not developed and could be developed only very imperfectly after the age of twenty-one. A boy brought up in the city, without work to do, without daily responsibility for practical affairs, without knowledge of the complex machinery of production, transportation and consumption of wealth and the economic relations which our complex social organization is designed to control, is deprived of the opportunity for the development of the actual physical structures in his brain which are necessary for the understanding of all these things and for the struggle for social betterment. The richer the boy's experience, the more he has to do with real affairs—agriculture, manufacturing, business—the better developed is his nervous system and the more completely will he be able to realize the faculties with which his parents have endowed him under the laws of heredity. Not only is this a scientific fact, but as you all know it answers to the common belief founded on the experience of the race.

Schools such as I have vaguely suggested which should offer apprenticeships to some at least of the many and varied activities of modern society, and in which book learning should take its place as an accessory to practical experience, would offer education and opportunity fitted to the talents of all pupils and would give the more capable a chance to make full use of their powers.

However the public schools are managed, a certain number of students will look beyond the schools and come to the university to satisfy their ambition or their love of intellectual effort. Those who come to the university are not always the most capable nor those best fitted to profit by the opportunities offered by the university. Students come to the university in great and increasing numbers. Is the state bound to give all these students a college education? Have they an equal right to what the university has to offer? Yes, *in so far as their inborn faculties and previous training fit them to profit by the university work and to give to the state or nation a proper return for the money and effort expended on them.* It should be the business of the university to train its students to perform such functions in the social body as require university training and to develop the most capable individuals to the highest degree possible, so that society may profit by their powers in the highest and most difficult tasks. In the university, as in the public schools but to a less extent, the most capable students suffer by working with the less capable or the careless and lazy. The university has no place for the lazy and careless student. If he does not find in some one of the schools or colleges stimulus and opportunity to call forth serious effort he should be sent home at once. Any toleration of such students in the university is a waste of the state's resources, an unkindness to the individuals, an injustice to the serious

students and little less than a crime against the community.

The less capable students form a second class which offer difficulties. Sometimes they succeed after awhile through finding subjects suited to their talents and interests. Most of them succeed to some extent if they make serious efforts; some of them fall short of any reasonable standards of scholarship. What standards should be applied to these students?

The tradition that the state owes a university education to all its youth is happily abandoned in most of the older states. Obviously, without scholarship standards the university would be so crowded with students that it would be impossible to carry on its work with any funds which legislators are willing to furnish. Clearly, then, it is the duty of the university to set such standards as will allow to remain in the university the less capable students only of such a degree and in such numbers as will not interfere with the main purpose of the university.

This main purpose of the university I conceive to be two-fold: first, to give each student an opportunity to try his powers and find out for what one among the varied functions in society demanding higher discipline of the intellectual faculties he is best fitted; and, second, to train him in the best possible manner for that work. The first purpose requires the university to receive a large number of students and to give them a reasonable time in which to find themselves. During this period it is one of the first duties of the university to rigidly weed out those who do not give promise of reasonable success. In no other way can the university perform its duty to the state. At the same time the university must offer to these students a sufficient number and variety of studies and sufficient advice and guidance to enable them to find that which best befits them. These functions belong chiefly to the college which I represent and they are at present very inadequately performed.

For the second purpose, the adequate training of students in their chosen fields, the university has a partially developed machinery. For those who choose one of the established professions the university provides separate professional schools. Each of these schools has had and still has to contend with the problem of weeding out the less fit. Even the requirement of a year or two years of college work for entrance to the professional school has not relieved these schools of incapable students, and it should be made to do so.

Of those who do not enter a profession two classes are to be recognized: those who would prepare for one of the newer professions called "vocations" and those who seek higher scientific training as a preparation for research or for creative work in arts and literature. Both these classes of students have the right—and this is the only inherent right which the university recognizes as belonging to the youth of the state—to have academic work offered to them which in its nature and in the conditions under which it may be pursued gives opportunity for the full exercise of their powers to the end that they may develop their faculties to the utmost. This opportunity the university does not furnish if it places the strongest students in the same classes with those far less capable than themselves. However much or little the less capable students profit by mingling with their brilliant fellows—and I am sure the gain to them is often far over-estimated and that the relation may actually be an injury to the much inferior student—the university which deliberately limits the activity of its best students by keeping them in the same classes with its poorest students, thereby denies the community the product of its best services in training citizens for

the highest duties and hampers social development and progress. Ways and means must be found for giving to each student opportunities commensurate with his powers, if society is to get the most from its university. In some way the advantages of a certain degree of segregation which have already been gained in the professions must be secured for those capable and desirous of the higher scientific training and intellectual discipline. For even in these realms the rule I have stated before holds good. The exercise of one's functions is necessary to bring about the development of the nervous mechanisms necessary in the fullest discharge of those functions. Innate faculties unused or not used to their limit, become less keen, dulled, blunted. This blunting of one's faculties is due to the arrest of development of nervous structures which are capable of development by use, and the fixation or dominance of already developed structures and pathways of nerve impulses. This is what we mean by the formation of mental habits and the inability to attack new studies. These things result in youth from the lack of mental stimulus and ever new and greater mental stimulus. If this new stimulus does not bait the student on during his college years, if the mental effort becomes lax, if the tension is slackened, the years of plastic growth of the nervous system are allowed to pass and the student fails forever of reaching the highest development of his powers.

Opportunity to find one's place and opportunity to do one's best for the sake of the highest development of one's powers, these are the watchwords of all education. These should be the standards of public school and university alike.

J. B. JOHNSTON
DEAN OF THE COLLEGE OF SCIENCE,
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UNIVERSITY OF MINNESOTA

THE FRUITS OF SCHOOL SURVEYS

THE following query has been and is without doubt in the minds of many who are aware of the recent rapid growth of the school-survey movement: Is the movement justified by the fruits of those surveys that have already been made? This article attempts to give at least a partial answer to this significant question by presenting the statements in this regard of the present superintendents of schools in cities where such surveys have been made.

Some readers may be inclined to ask whether, in view of the relation some of these surveys have borne to the superintendency, the incumbent of that office is the person to whom one would look for a sufficiently unprejudiced evaluation of the results of a survey to make an inquiry of this kind of use. While this relation may, in a few cases, incapacitate the superintendents from making more than a distorted evaluation, it must be granted that they, above all others concerned, because of their special knowledge of school affairs and intimate touch with them in their own community, should be most likely to give an intelligent and dependable response to such a question.

The following letter was addressed to twenty-five superintendents in cities whose systems have been surveyed sufficiently long ago to have permitted the appearance of results in some sort:

October 18, 1916

Supt. ————————.

————————.

Dear Sir: Recent years have seen the making of a large number of school surveys. Present tendencies point to a rapid increase in their number. We have had, however, very infrequent statements as to what the surveys have accomplished in the communities in which they have been made.

As your system is one of those that have been surveyed, I am asking you—if you do not consider the task too great—to make to me a brief statement of what the fruits of your survey have been up to date. If you already have these results

set forth in printed form, such a statement will suffice.

Eighteen responses to this inquiry are at hand touching surveys in cities ranging in population from twenty-five hundred to more than a half million. There are sixteen letters and five printed statements of varying length, three of the latter accompanying an equal number of the former. As a few of the superintendents have expressed the desire not to have their names divulged in the presentation of this material, the writer refrains from the use of names of cities or of their superintendents except in a single instance where the superintendent made reference to a printed statement that has already had some publicity. Obviously, if names of all superintendents who are willing that their names should appear in connection with such of their statements as are quoted herein were made known, the names of those few who have just been referred to would be readily, even though indirectly, discoverable.

THE EFFECTS OF THE SURVEYS IN GENERAL

The testimony of the superintendents is with few exceptions in support of the surveys. Fourteen of the total of eighteen statements are of this favorable character, with but three unfriendly, and the remaining one non-committal. Four of the fourteen responses classed as generally favorable were judged to be so from the specific results which their writers report that the surveys have achieved and which are catalogued below under "Specific Fruits of the Surveys." The attitude of the remaining ten superintendents may be seen in the following quotations from their statements:

1. We feel that the survey has benefited us in a large way and, if it were to do over, I think our people would be glad to have the survey made.

2. . . . I beg to say that we have made some changes after surveys had been made of our school system.

3. No one here has ever questioned their [the surveys'] value. No doubt, the results to the school district were worth far more than the surveys cost us.

4. . . . I have found in many instances that things which I have recommended have been referred back to the report made by the survey committee and in every instance it has been a help to me. . . . I may personally say that the survey has been of a great deal of help to me. As far as the personnel of the teaching force is concerned, I doubt very much its real value.

5. I might say in general that the chief benefit of the survey was to strengthen the faith of the people of ———— in the excellence of their schools.

6. . . . . ———— [the surveyor] made certain suggestions which resulted in a modification of existing practises.

7. On the whole I think it has been helpful. Some sore places are left that are not entirely healed yet.

A printed statement issued by a non-school agency in this city states that "the most important benefit of this survey to the community is that it has awakened great interest in public school affairs."

8. The survey was of much value, as the teachers, patrons and board of education were aroused to the need of improvement, but the survey was not decidedly destructive and had much in it of commendation. . . . All the innovations that I have recommended have been along lines suggested by the survey. Thus I have been able to refer to the survey and have not been compelled to assume all of the responsibility.

9. The real value of the survey was the enlightenment of the people by the presentation of the matter as the view of an outside and unprejudiced authority. The effect of this was that it became easier to get some of the changes desired by the board of education and school officials.

10. . . . we all regard the survey as being exceedingly helpful and disappointing in no respect. Many things we had been looking for and unable to secure, we were able to obtain through the interest created by the report.

Quotations from the three statements in general unfriendly to the surveys are as follows:

1. . . . the ———— survey told us many things, most of which were not new to those engaged in

the local school service. It pointed out some weaknesses of which we had been conscious, but owing to lack of funds we had not been able to overcome. Moreover, for the same reason we have not been able to do the things desired since the survey was made. The ———— survey was largely a muckraking effort.

2. I took office several months before it [the report of the survey] was published and it was several months after that that a copy of it came to my notice. I found when I read its suggestions that I had already made all the changes suggested and many more. The need of the changes was too obvious to require any survey to ascertain the trouble.

3. I think everybody in ———— is agreed that our survey was a fizzle. It dealt only with unimportant details.

It is evident that the authors of the first and second of these three quotations are writing without a full comprehension of the function of the survey: it does frequently call attention to a need of changes that may be very obvious to the school people on the ground, but it does so because the report of the survey is a publicity document aiming at community cooperation in effecting the changes. It may be worth while to note that material has appeared in the columns of educational periodicals to indicate that the survey in the system at whose head is the superintendent whose statement is reproduced in the first quotation has been widely fruitful. It may also be asked whether it is not probable that the accomplishment of the reforms referred to by the superintendent quoted in the second unfavorable statement was accelerated because the needs had been pointed out by the survey, even though the superintendent was not conscious of their having been brought to the attention of the board and of the community.

SPECIFIC FRUITS OF SCHOOL SURVEYS

Most of the superintendents making responses favorable to the surveys did not stop with statements of the general effect of the surveys on their school systems, but proceeded to recite some of the specific fruits as they have observed them. Only three responses fail to refer to such specific results. A count of the benefits reported by the remaining eleven superintendents shows that they range in number from one to almost fifty and average approximately ten per system. However, as mere numbers can here signify little, it is necessary to present direct testimony. This may be done by presenting (*a*) the results as indicated in two statements of specific benefits in order to illustrate the variation in range of benefits reported, and (*b*) the results of an attempt to classify all the specific benefits recited.

To illustrate the variation in the range of specific results reported, we quote two statements, one, a part of the letter of a superintendent who cites a single benefit and the other a printed statement of results in the Springfield, Illinois, school system, a statement that details fourteen specific results. The former statement is as follows:

. . . will say that this survey did what it was intended to do, namely, wake up the people to the need of better school buildings. . . . the town bonded itself for $250,000 for school buildings.

The latter is reproduced here in the form in which it appears in "Community Action through Surveys," a paper presented by Shelby M. Harrison at the Indianapolis meeting of the National Conference of Charities and Correction in May, 1916, and published as a bulletin of the Department of Surveys and Exhibits of the Russell Sage Foundation:

1. The Rules of the Board of Education have been revised, reducing the number of committees to three, as follows: (*a*) Education, (*b*) Finance and Supplies, and (*c*) School Property.

2. The junior high-school system has been adopted, and four junior high schools organized.

3. A new high-school principal was elected, and

the entire organization and course of study changed. Everything complained of in the survey has been eradicated. A well-planned system of supervised study has been introduced, and the very best of discipline is obtained without friction.

4. A new modern high-school building is now being erected and will be ready for occupancy next year. This building will accommodate about 1,500 pupils, and will cost, completed, nearly $500,000.

5. The lighting, ventilation and general sanitation of all the schools have been given attention and greatly improved. Fire-exit locks have been placed on all outside doors, and fire escapes on the high school.

6. The new school buildings in course of erection meet the highest standards of requirement with respect to lighting, heating, ventilation and sanitation.

7. A special supervisor of buildings is employed who sees that all of the property of the district is kept in proper repair.

8. Patrons' clubs have been organized in every district of the city, and nearly every school house is now used as a social center for neighborhood meetings. Public meetings and political discussions are held in the auditoriums of the several schools, and about one third of the voting places of the city are now located in school buildings.

9. The number of teachers employed in manual training and household arts has been more than doubled since the survey, and pre-vocational training and guidance are promoted.

10. The school census has been revised, and valuable additional information is now obtained.

11. A new salary schedule for teachers and janitors has been established on a basis of efficiency, and the required qualifications of principals and teachers have been raised.

12. Seven branch libraries have been established in as many different schools, and five other centers, the books being furnished to each of these twelve schools through the city library.

13. Attendance department has been reorganized and an experienced supervisor of attendance has been secured. The work of the department has been studied and carefully systematized.

14. Finally, the entire course of study for the elementary, junior high and senior high schools, has been revised and modernized.

Mr. Harrison says further in his paper that in compiling the list of results, "no special effort has been made to gather inclusive data."

The specific results recited have been classified under the following heads: administrative control and conduct of school business, supervision, the teaching staff, school organization and curricula, the school population, buildings and equipment, health, school and community and miscellaneous. This catalogue of results may furnish rather monotonous reading, but their character and extent can be nothing but impressive, despite the facts that relatively few of the superintendents would be ready to admit that they had made statements based upon a complete canvass of the situation to ascertain the benefits and that a few made no statement of such specific benefits.

Administrative Control and Conduct of School Business.—Under this category are placed the following results: "A new system of control placing entire responsibility for the entire department in the hands of the superintendent has been inaugurated . . .;" "better boards of education;" rules of the board revised so that there are fewer committees; "a new and efficient system of accounts;" "a more efficient system of ordering, purchasing and recording supplies and equipment, and of accounting for other expenditures . . .;" the annual budget and report is published "either in the newspapers or as a separate document"; a better system of records has been provided; the records of text-books are better kept.

Supervision.—Larger freedom of control granted to each school, the responsibility now resting more in the principal; the system of fines for absence from teachers' meetings, tardiness at school sessions, etc., abolished; provision made for live teachers' meetings; studies of retardation, promotion and elimination have been made "with the view of learning and ameliorating as far as possible the individual causes which prevail against backward and ab-

sent children"; use of standardized tests; better supervision of high-school work; teachers keep more detailed records of plans and progress; final examinations and promotional system entirely changed, the former being eliminated as the basis of the latter; teachers no longer dismiss school at will and at irregular hours; a plan in operation of rotating teachers so that pupils may retain the same teacher for three years.

The Teaching Staff.—One superintendent reports: "Teachers were aroused. Nearly 50 per cent. of them went to school some place" during second summer following survey. "Great numbers of them took a leave of absence." Another statement concerns a new salary schedule for teachers with promotion on the basis of efficiency, and an elevation of qualifications. A third report speaks of increase in size of the elementary-school staff and a decrease in the size of the high-school staff.

Related to School Organization and Curricula.—The following changes along these lines are reported: junior high-school system introduced; ungraded rooms provided; evening-school offering extended; departmentalism applied to music and drawing above the third grade; elementary- and high-school program of study revised and modernized; teaching of academic work strengthened; "our course of study now, instead of being dry and mechanical, is touching the life of the community . . .;" German is now offered in two elementary schools; history and arithmetic were modified to meet the recommendations; history and civics have been vitalized; twice as many teachers now in manual training and household art, and prevocational training and guidance introduced; course of study in domestic science for elementary schools provided; double laboratory periods provided for work in home economics; "community houses" provided for training girls along lines of domestic activity; high-school teacher-training course now plans to prepare for work in rural schools only; courses have been more carefully outlined and are now printed; courses in science introduced into elementary schools; more emphasis on silent reading; good writing is a prerequisite for admission to book-keeping courses.

School Population.—As a result of modernizing courses "grammar schools are fuller to-day than we have ever had them"; percentage of retardation has been reduced in four years from 27.95 to 15.77, a reduction of 12.18 per cent.; school census has been revised to obtain more and better information; the attendance department was reorganized, an experienced worker employed and the work systematized.

Buildings and Equipment.—"The patrons were ready to enter into an era of enlargement and voted $800,000 for new buildings;" new high-school building under construction, costing approximately $500,000; town bonded itself for a quarter of a million for school buildings; "definite action begun to correct building deficiencies;" more light provided for some class-rooms; one report mentions ten minor improvements, such as rehanging doors to swing outward, removal of all writing, marking, etc., from walls and toilets, repainting all woodwork, provision of more room, shifting rooms to departments in high school that were underprovided, building of walks, etc.; special supervisor of buildings provided, etc.; the appointment of "by all odds the most capable inspector of school buildings we have ever had"; janitors paid on the basis of efficiency; more and better pictures for decoration; supply cases built for each teacher.

Health.—Lighting, ventilation and general sanitation of all schools greatly im-

proved; seating changed to improve lighting; more windows cut to increase light; sanitary drinking-fountains provided; sanitary paper-towels provided; cloakroom lighted and ventilated, banisters provided for stairway leading to upper story; new buildings erected meet highest standards with respect to lighting, heating, ventilation and sanitation; temperature of rooms kept at 68 degrees; fire-exit locks placed on all doors; physical exercise introduced; teacher of physical education employed; more physical education provided; pupils in poor health excused from afternoon attendance; open-air room provided; warm lunches provided.

School and Community.—It is dawning on school people that the greatest function of the school survey is to acquaint the community with the status of its schools. That this is being accomplished is seen to be expressed or implied by a number of the superintendents in those sections of their statements quoted above under "The Effect of the Surveys in General." Other fruits of the survey along the line of the relation of school and community are to be found in the following: "better cooperation between parents and teachers;" a parent-teacher organization in each elementary-school building; patrons' clubs in every district of the city and nearly every district a social center.

Miscellaneous.—Savings banks organized; branch libraries placed in schools; athletics placed on an ethical basis; high-school teachers not being permitted to change text-books at will; law relating to text-books being obeyed; better discipline.

Of course, as Harrison remarks,[1] even after the needs of the school system have been pointed out by the survey, "the program must be *carried out* very largely by other agencies than those that made the investigation, and they should come in for a good deal if not for most of the credit for results." No one can contend that survey fruits will follow automatically upon recommendations without subsequent expenditure of energy by school officers and other members of the community whose schools have been surveyed. But, calling the attention of the school staff and the public to the school needs of a community in the striking and convincing manner possible to the survey makes the school improvements that follow, where there is coincidence between needs pointed out and improvements effected, not less than causally connected chronological sequels of the survey. On this ground we are warranted in looking at these improvements as the fruits of the surveys.

These, then, are the fruits of city school surveys as shown in the brief statements of the superintendents. Both in the more general and in the specific relations, this array of results, incompletely as they must have been reported by school heads who have almost numberless more imperative calls upon their time and attention, points to an emphatic justification of the survey movement and furnishes encouragement for its extension. On account of the youthfulness of the science and art of school surveying, it is not surprising that some surveys have been amateurish and crude and may have wrought more havoc than they have effected progress. This may have been true of the survey referred to by the superintendent a part of whose statement has been presented in the second quotation of unfavorable responses above. Or, again, this same youthfulness may account for the ineffectiveness referred to by the superintendent quoted in the third unfavorable response. To say the least, this is a remarkable showing for so new an implement of progress. With the advancement in

[1] Pp. 20–21, *loc. cit.*

school surveying that has been and will be made we may hope for even more and better fruits in the future.

LEONARD V. KOOS
UNIVERSITY OF WASHINGTON

EDUCATIONAL EVENTS

SCHOLARSHIP AT THE UNIVERSITY OF WASHINGTON

ACCORDING to the report in the bulletin of the university the scholarship of all classes of students at the University of Washington is higher this year than it has been any time during the last three years. A graphic chart issued by the recorder's office shows the comparative grade records of the students for the college years of 1913–14, 1914–15 and 1915–16.

The graph shows a slight decrease in average scholarship for all classes in 1914–15, but indicates a marked advance for the present year. For purposes of classification the students were divided into organized women, unorganized women, organized men and unorganized men, an organized group being one whose members live in the same house and maintain a close affiliation. The unorganized groups are made up of independent students. The organized women have maintained a more uniform scholarship for the charted period than any of the other groups. The organized men show the greatest amount of improvement on the chart. The organized women, after dropping in scholarship in 1914–15, rose again this year approximately to the level they attained two years ago. The curve for each group dropped considerably during 1914–15, but in every case rose in 1915–16 to a higher point than that charted two years ago.

The organized women held close to the 85 per cent. mark for the three-year period. The grand average of the unorganized women dropped from above 85 per cent. to about 80 and then rose this year again to above 85. This is the longest drop on the chart.

The unorganized men, who in 1913–14 were registering a grand average of about 80 per cent., fell a few points last year, and scored to above 85 per cent. this year. The organized men were slightly below the unorganized in 1913–14, forged ahead the next year, only to drop behind again this year.

The relative positions of the groups in the successive years show little variation. Both two years ago and this year the unorganized women led the field in scholarship; they were closely followed in order by the organized women, the unorganized men and the organized men. In 1914–15, however, the organized women as a group received the best grades but were closely pressed by the unorganized women, and the unorganized men dropped behind the organized groups.

EVENING CLASSES AT THE UNIVERSITY OF CINCINNATI

THE University of Cincinnati announces that the total registration in its evening classes is 768. Of this number over 40 per cent. are classified as possible candidates for degrees, having satisfied the university entrance requirements. There is an increase in the number of candidates for degrees of 9 per cent. over last year. Whereas the evening registration shows an increase of 133 students over the enrollment of September, 1915, there was this year a decrease in the number of freshmen entering the day classes; it is probable that some students who ordinarily would have entered the day classes found employment and decided to continue their education in the evening session.

Experience has shown that the evening session of a university is likely to be secondary to the day session, with standards not quite equal to those demanded of regular day students. The students are likely to be unprepared for the courses they elect and to feel little loyalty to the institution.

In the University of Cincinnati this year, the attempt was made to select students who by previous training were really competent to undertake the work, and, if satisfactory credentials could not be presented, to exact entrance examinations of all special students. As a result, the students entering as specials this year have made good records; and there has been less irregularity of attendance and dropping-out on the part of students than in previous years.

In order to induce a greater spirit of solidarity, evening convocations and social gatherings have been encouraged. Special attention has been given to the physical education both of men and women and the gymnasiums have been opened for the use of evening students. In order to correct the tendency to elect studies from year to year without reference to a definite plan, steps have been taken to provide evening students with advisers, to the end that greater continuity and unity may be secured in the students' work.

THE SCHOLARSHIPS OF THE UNIVERSITY OF THE STATE OF NEW YORK

THE twelfth annual report of the State Department of Education contains a list of the names of the students who won the university scholarships in 1916.

We quote from the *Cornell Alumni Weekly* the distribution of the 742 scholars who had reported:

STATE UNIVERSITY SCHOLARS, 1916

College	Men	Women	Total
Cornell	125	47	172
Hunter	1	120	121
Columbia	55	4	59
Syracuse	20	37	57
N. Y. S. C. for Teachers	2	52	54
C. C. N. Y.	48	..	48
Barnard	..	34	34
Rochester	16	18	34
New York University	23	..	23
Vassar	..	19	19
Hamilton	18	..	18
Rensselaer P. I.	15	..	15
Union	14	..	14
Elmira	..	13	13
St. Lawrence	1	9	10
Adelphi	..	8	8
Colgate	8	..	8
Wells	..	7	7
Hobart	5	..	5
Polytechnic Inst., Brooklyn	4	..	4
William Smith	..	4	4
New Rochelle	..	3	3
Alfred	1	1	2
D'Youville	..	2	2
St. Francis	2	..	2
Canisius	1	..	1
Cathedral	1	..	1
Clarkson Coll. of Technology.	1	..	1
Fordham	1	..	1
Niagara	1	..	1
St. John's	1	..	1
Total in 31 colleges	364	378	742

There are now three thousand holders of these scholarships in the colleges and universities of the state. The following table shows *approximately* the number of men and the number of women in the list, and the number who have come to Cornell:

Year	Men	Women	Cornell
1913	405	345	150
1914	355	395	157
1915	367	383	171
1916	368	382	172
Totals	1,495	1,505	650

The university scholarships were established by chapter 292 of the Laws of 1913, and are maintained by the state under the direction of The University of the State of New York. Five scholarships are awarded annually to each county for each assembly district therein, making a total of three thousand such scholarships for the state. Each scholarship entitles the holder to the sum of one hundred dollars for each year he is in attendance upon an approved college in this state during a period of four years. A person entitled to a university scholarship may enter any college in New York State approved by the University of the State of New York, and may pursue any course except professional instruction in law, medicine, dentistry, veterinary medicine or theology.

Those entitled to university scholarships are such persons as receive college entrance diplomas during the preceding school year. Appointments are made from such a list of names in the order of their merit. In case of a vacancy or of a refusal to accept a scholarship, the pupil standing next highest on the list is entitled to the appointment. With each certificate of award to each scholar, there is sent a note signed by President Finley, which reads as follows:

With the opening of the new year the state scholarship law comes into full operation. The state has now three thousand scholars of The University of the State of New York as students in the colleges and universities of the state. As executive officer of this university through which the special interest of the state is expressed, I send you, as one of these, greetings and good wishes for the new academic year. May you be conscious of our solicitude for your progress and for the continuation of the excellence which recommended your appointment, and may

you develop a sense of "state-mindedness" which will prompt you to give service to the state whenever opportunity offers.

EDUCATIONAL WORK IN THE NAVY

IN his annual report as Secretary of the U. S. Navy for the year ending December 1, 1916, Secretary Daniels writes as follows:

The navy offers a wide variety of industrial courses to ambitious young men. If the recruit has had some training or experience in electricity, he may enter either the general or the radio classes of the electrical schools, one at the Brooklyn and the other at the Mare Island Navy Yard. Here the course of instruction comprises machine-shop work, reciprocating steam engines, steam turbine engines, internal combustion engines, magnetism and electricity dynamos, motor generators, alternating currents, batteries and the like. In the radio group there is thorough practise in the radio mechanism for receiving and sending. In the Artificer School at the Norfolk Navy Yard men are taught to be shipwrights, ship fitters, blacksmiths, painters and plumbers. Both at Newport, R. I., and San Francisco are yeomanry schools, where the men are perfected for the clerical work of the navy to become expert stenographers, typewriters, bookkeepers, etc. An attractive line in the navy is the Hospital Corps with schools at Newport, R. I., and San Francisco. Not a few men have gone out of these schools after their navy service to make good doctors in civil life, after the thorough training received in anatomy and physiology, nursing, first aid, and emergency surgery, hygiene and sanitation, pharmacy, materia medica, toxicology, chemistry and the like. Music is essential to vary the secluded life afloat, and the boys with musical talent are instructed in the schools at Norfolk and San Francisco. The machinist school at Charleston is open to men who show themselves apt in mechanical work. The coppersmith school is located also at Charleston. The two commissary schools are at San Francisco and Newport. At Pensacola every three months a class of sixteen enlisted men, selected by the commander-in-chief of the Atlantic Fleet, is trained for an eighteen months' course in aeronautics. The course is divided into two classes—mechanics and flying. The men are afterwards transferred to general service and are entitled to additional pay of 50 per cent. while detailed to the duty of actual flying. The seamen gunners' school is located at Newport, where a special study of the torpedo is made.

Under twenty years of age and after a year's service, a bluejacket may stand the examinations for admission to the Navy Academy, where twenty-five lads from the service are admitted annually. Here they are making good, and one of them has already been elected president of his class. If he is studious and ambitious, the bluejacket may rise in due time to wear the much-envied four stars of an admiral.

But whether a bluejacket remains in the navy with opportunity to climb to the highest pinnacle of success, or whether he learns a trade and retires eventually to civil life to ply it, he gets in the navy one of the finest trainings available anywhere, an experience unique and broadening, and in which he is well fitted for the duties of patriotism and of citizenship in the greatest republic on the globe.

EDUCATIONAL NOTES AND NEWS

THE Executive Committee of the National Education Association has decided to hold the next session at Portland, Oregon, provided the transcontinental passenger association consents to make a satisfactory rate. The northwest has never had a meeting of the association.

PRESIDENT R. J. ALEY, of the University of Maine, president of the National Education Association, will deliver an address to the teachers of Cincinnati, on February 23, on "The Care of the Individual in Education."

JOHN D. SHOOP has been unanimously re-elected superintendent of the Chicago schools.

THE board of trustees of Tuskegee Normal and Industrial Institute have elected as chairman to succeed Seth Low, Mr. William G. Willcox, president of the Board of Education of New York City, who has for ten years been a member of the board.

ACTING CHANCELLOR FREDERIC A. HALL, of Washington University, St. Louis, has been appointed chancellor to succeed Dr. David F. Houston, who for nearly four years has been on leave of absence while serving as secretary of agriculture in President Wilson's cabinet. There had been some expectation that Chancellor Houston would return to his duties as chancellor of the university after March 4, but his resignation, due to his decision to remain

in the cabinet, left the vacancy which was filled immediately by the promotion of Dr. Hall. The new chancellor, who is sixty years old, was born in Brunswick, Mo., and was educated at Drury College, Springfield, Mo., and in Germany. From 1898 until 1901 he was dean of Drury College. In the latter year he went to Washington University to teach Greek. In 1912 he was appointed dean and shortly thereafter became acting chancellor, which post he has held during the four years' absence of Chancellor Houston at Washington.

MAYOR MITCHEL, of New York, on January 9, announced the appointment of twelve members of the Board of Education, four of whom are reappointees, five new members for a full term of five years and three new members to fill unexpired terms caused by resignations. One of the men designated for a five-year term is Dr. E. P. Roberts, a negro physician. This is the first time since 1898 that a negro has served on the board. The appointees from Manhattan are as follows: Isadore M. Levy, reappointed; Cornelius J. Sullivan, reappointed; Joseph P. Brennan; Dr. E. P. Roberts; Mrs. Irma B. Levy, appointed to succeed George J. Gillespie, resigned, whose term expires December 31, 1917. The following appointments from Brooklyn were made: Joseph Barondess, reappointed; James H. Post, president of the National Sugar Refining Company of New Jersey; George F. Allison, a lawyer, appointed to succeed Miss Mary E. Dreier, resigned, whose term expires December 31, 1919. The Bronx appointments are: Elisha Harris Janes, an architect; William J. Weber, appointed for a term of four years to succeed Thomas J. Carroll, deceased. William W. Gillen, Jamaica, a lawyer, was appointed for a five-year term, and John Martin, of Richmond, was reappointed. The former members who were not reappointed were: Thomas M. De Laney, Dr. D. J. McDonald, Morton Stein, Rupert B. Thomas and Frank D. Wilsey.

AT Yale University, Dr. A. F. Kovarik has been appointed assistant professor of physics in the scientific school, and Dr. R. V. Westerfield, assistant professor of political economy in the college.

DR. ARTHUR HUNTINGTON NASON, assistant professor of English at New York University, has been appointed to a full professorship.

COLIN V. DYMENT, for thirteen years a newspaper man in the Pacific Northwest and for the past three and a half years a member of the faculty of the school of journalism at the University of Oregon, has been nominated professor of journalism and administrative head of the department at the University of Washington. Professor Fred H. Heath, of the University of North Dakota, has been appointed assistant professor of chemistry. He will fill the place left vacant last October by Dr. James E. Bell when he accepted a position in the chemistry department of Throop College of Technology at Pasadena, Cal.

DEAN ALFRED VIVIAN, of the College of Agriculture of the Ohio State University, is one of the three men in Ohio who will cooperate with the United States department of agriculture in the plans under way in federal and state departments to establish the teaching of agriculture in Ohio public schools.

PROFESSOR ALBERT J. CARNOY, formerly a professor at the University of Louvain, Belgium, gave a free public lecture at the University of Pennsylvania, on December 30, entitled "The Struggle for Democracy in Ancient Times."

MR. JOHN D. ROCKEFELLER, JR., will address the students of Cornell University on Founders Day on January 12 on "The Personal Relation in Industry."

THE faculty of the University and Bellevue Hospital Medical College announces a course of five lectures to be given under its Herter Foundation on "The Distribution of Inorganic Compounds in Animal and Vegetable Tissues, and the Forces that Determine It," by Professor A. B. Macallum, of the University of Toronto, beginning on Monday, January 8, at four o'clock, and continuing daily at the same hour at the Carnegie Laboratory, 338 East 26th Street, New York City.

DR. W. W. KEEN, of Philadelphia, will occupy the Colver lectureship at Brown University in 1917, delivering three lectures. January 10, 15 and 17, upon "Medical Research and Human Welfare—A Record of Personal Experience and Observations during a Professional Life of Fifty-seven Years."

THE fifth annual conference of Educational Associations was held in the University of London, South Kensington, from January 1 to 6. The Master of Balliol opened the proceedings with an address, and Sir Henry A. Miers, F.R.S., vice-chancellor of the University of Manchester, presided.

THE officers and members of the council of the Mathematical Association of America for the year 1917 elected at the recent New York meeting are:

President: Florian Cajori, University of Missouri.

Vice-presidents: Oswald Veblen, Princeton University; D. N. Lehmer, University of California.

Secretary-Treasurer: W. D. Cairns, Oberlin College.

Additional Members of the Executive Council: R. C. Archibald, Brown University; B. F. Finkel, Drury College; E. R. Hedrick, University of Missouri; E. V. Huntington, Harvard University; Helen A. Merrill, Wellesley College; E. H. Moore, University of Chicago; R. E. Moritz, University of Washington; M. B. Porter, University of Texas; D. E. Smith, Columbia University; J. N. Van der Vries, University of Kansas; J. W. Young, Dartmouth College; Alexander Ziwet, University of Michigan.

Publication Committee: W. H. Bussey, University of Minnesota; R. D. Carmichael, University of Illinois; H. E. Slaught, University of Chicago, *Managing Editor.*

AT a recent meeting of the New York City Board of Education Dr. John Whalen, on behalf of the Committee on High Schools and Training Schools, offered the following tribute to Dr. Gunnison:

The Board of Education records with deep regret the death, on December 19, 1916, of Dr. Walter B. Gunnison, principal of Erasmus Hall High School. Dr. Gunnison was a graduate of St. Lawrence University. After teaching for eleven and one half years in elementary and high schools in Maine and in New York state, he entered the public schools of this city in September, 1885, when he was appointed principal of P. S. 19, Brooklyn. He continued as principal of that school for eleven years, and was then appointed principal of Erasmus Hall High School, in which position he continued until his death.

Dr. Gunnison endeared himself to all who knew him. His buoyant temperament, his vivid interest in life in all its aspects, his interesting personality, attracting, never repelling, produced that deep affection which people felt for him and which was so well reflected in the loyalty of his pupils.

Resolved, that the foregoing be adopted as expressing the loss felt by the Board of Education by reason of the death of Dr. Gunnison, and that the same be spread upon the minutes of the board.

A GIFT of $150,000 from J. P. Morgan, of New York, to aid the campaign for an endowment of $1,000,000 for Trinity College is announced. The endowment is to be used for increased salaries of the faculty and for a new chapel and gymnasium. Mr. Morgan is a member of the board of trustees of the college.

THE campaign for $200,000 for the endowment fund of the Woman's Medical College, Pennsylvania, has been successfully completed.

THE board of trustees of the Emma Willard School announces that Mrs. Russell Sage had given $250,000 toward the work of the Russell Sage College of Practical Arts, the only requirement being that the money should be used in the same way as the original gift of the same amount given a year ago to establish the college.

AT a recent meeting of the council of the University College of Wales, Aberystwith, it was announced that friends of the college had expressed their intention of contributing £100,000 to the funds of the college, subject to a reservation of their right to make proposals to the council either as to the capital or the income.

THE opening of the new year is being celebrated at Berea College with the formal dedication of two large and three small new buildings to provide additional equipment for its work among the mountain people of the southern states. Berea now accommodates in its five departments 1,400 students and hopes to increase its capacity to 2,000.

The Jesuit faculty of Boston College has moved into its new quarters at University Heights. The new building, St. Mary's Hall, now ready for occupancy, is said to be a beautiful specimen of modern architecture and workmanship and undoubtedly the finest building of the Jesuit order in this country. It is the second building to be erected on the new site of the college and, according to the general scheme to be observed, it is of pure Gothic architecture. A group of twenty buildings all in this same style is planned. There are in all sixty-four rooms, forty-five of which are to be devoted to living rooms for the faculty.

A committee of alumni of the University of Pennsylvania has been formed to build a stadium or bowl to hold 100,000 spectators to supplement Franklin Field, the capacity of which is about 32,000. The chairman, Henry Laussat Geyelin, has appointed Paul Thompson, C. S. W. Packard, Joseph B. Townsend, Jr., Ellis Ames Ballard, Thomas Reath and Francis S. McIlhenny.

Increases of approximately 10 per cent. in the salaries of all teachers and of employees of the Pittsburgh schools receiving $75 a month or less have been approved by the city board of education. The increases will affect more than 500 teachers.

The University of Cincinnati reports that at a meeting of the local branch of the American Association of University Professors held on December 8, 1916, the following resolution was adopted: "That the local chapter of the university endorses in full the report of the Committee on Insurance and Pensions as published in the bulletin for November, 1916." It was also moved and carried that a committee be appointed to consider the advisability of the cooperation of the deans and faculties in preparing the annual university budget; and that another committee be appointed to consider the question of the proper cooperation of the deans and faculties in appointing and dismissing members of the faculty.

The National Association of Directors of Educational Research will meet in Kansas City, Missouri, on March 1, in conjunction with the Department of Superintendence of the National Education Association. Dr. Walter S. Monroe, of the Bureau of Educational Measurements and Standards at the Kansas State Normal School, Emporia, is chairman. The program is as follows:

"The Problem of Measuring Ability to Read Silently," S. A. Courtis, Supervisor of Educational Research, Detroit, Michigan; H. W. Anderson, Bureau of Educational Research, Dubuque, Iowa.

"Correlation between Ability to think and Ability to remember, with special reference to United States History," B. R. Buckingham, Educational Statistician, State Board of Education, Madison, Wisconsin.

"Organized Effort in Educational Research in City School Systems," J. P. O'Hern, Rochester, New York.

"Fundamental Problems of Educational Research from the Point of View of a State Bureau," Charles Fordyce, Nebraska Bureau of Educational Measurements, University of Nebraska, Lincoln, Nebraska; F. J. Kelly, Bureau of School Service, University of Kansas, Lawrence, Kansas; H. A. Brown, Bureau of Research, Department of Public Instruction, Concord, New Hampshire.

The *Journal* of the American Medical Association states that on January 1 the electors of Toronto voted on the question of placing the medical inspection of school children under the medical officer of health. Since its inauguration some six years ago, it has been under the control of the board of education, with a chief medical inspector and several assistants and school nurses. Lately, however, it has been found that the work of the school nurses and those of the well-organized department of health was being duplicated; and, as there is every evidence of a desire to save on the part of the taxpayer, and as the board of health and the board of education could not arrange terms for amalgamation, which amalgamation has been estimated would save at least $35,000 to the city annually, it was decided to submit the proposition to the people at the municipal elections. The medical officer of health, Dr. Charles J. Hastings, has issued a bulletin, setting forth the work of the department under his charge, in the form of a

chain, which showed one link missing, namely, that of medical inspection of school children, and showed a continuous chain of health department activity as adopted in New York, Chicago, Philadelphia and other large cities of the United States.

DISCUSSION AND CORRESPONDENCE

MARKS IN COLLEGE BIOLOGY AS AFFECTED BY PREVIOUS TRAINING

IN SCHOOL AND SOCIETY for July 10, 1916, pp. 69–72, there appears an article by H. S. Colton entitled "The Bearing of High School Science on a College Course in General Zoology." This article gives the results of an investigation of the marks made by students in the course in zoology at the University of Pennsylvania with reference to their previous training, and closes with an expression of the hope that similar investigations may be made elsewhere.

The present paper gives the results of an investigation made along similar lines at Yale in connection with the academic course in general biology. At the outset it must be stated, however, that the conditions under which this course is given at Yale are in many respects quite different from those prevailing at the University of Pennsylvania. In the first place, the subject-matter of the two courses is different. The course at Yale is a composite one, including not only zoology, but also botany and physiology. Again, the course at Yale is not open to election by freshmen, but is composed of those members of the sophomore, junior and senior classes who elect it. Since the student at Yale must elect at least one science or mathematics in the freshman year, it results that practically all the members of the class in biology have taken either chemistry or physics before biology, and in many cases both of these subjects have been taken before the work in biology, especially if the high-school courses in these subjects are taken into account. Still another difference in conditions makes it necessary that the present study should differ somewhat in procedure from that undertaken at the University of Pennsylvania. At Pennsylvania it was possible to group the students who had prepared at the Philadelphia high schools for purposes of comparison with other groups. At Yale, however, no high school or group of high schools is represented by a number of students sufficiently large for this purpose. Nevertheless, the number of students taking biology at Yale, who have had previous training in some one or more of the various phases of the subject, is sufficiently large to warrant a comparison of the grades of these students with the rest of the class, in order to discover whether there appears to be any advantage to those who have had biology in their secondary-school training.

In connection with the present study there have been examined the records of 521 students who took the course in elementary biology at Yale during the academic years, 1913–14, 1914–15 and 1915–16. This includes all the members of the class in biology for these three years except those who for one reason or other had dropped out from college, and from whom the necessary information could not be obtained. Of these 521 students, 102 reported that they had taken courses in one or more of the phases of biology mentioned above during the time of their preparatory training.

The marking at Yale is based on a system in which 400 represents the standard of perfection, and 200 is the passing mark. The average mark in biology of the 102 students who had previous training in one or more phases of the subject was 277, while the average for the remainder of the class was 268. However, among the 102 students reporting themselves as having had some previous training there are 29 who had had physiology alone. Many of these students reported that this physiology had been of a very elementary character, and it seems, therefore, reasonable to leave these students out of account entirely. If this is done, it is found that the 73 students who had genuine secondary-school training in biology have an average grade in the college course in biology of 286, while the 419 men who had no such training made an average grade of 269. It is safe to say that any teacher at Yale would agree that a grade of 286 is significantly higher than one of 269. The group of students with

previous training in biology (if we exclude those who have had physiology alone) have for some reason attained a higher efficiency, judged from the standpoint of marks, than the rest of the class. Can it be said that the former secondary-school training in biology is the controlling factor? It is clear that it would not be safe to make this assumption without first attempting to discover whether this group may not be a selected one for some other reason.

This turns out to be the case, for this group is not only superior to the rest of the class in biology, but in other subjects also. The general average in subjects other than biology taken in the same year as the biology is 280 for the smaller group, and 269 for the larger. Unless we are prepared to hold, therefore, that the previous training in biology has been the controlling factor in these other subjects, it can scarcely be believed that it has had great significance in effecting the higher average grade of this group in biology. We seem to have here only one more illustration of the rule which has been found to hold true for Yale and for several other institutions that the high-school pupil in general does better after entering college than the student prepared at the private schools. It appears from the data presented in the article referred to above that this rule holds good also at the University of Pennsylvania. The reasons for the higher standing of the high-school students in college can not be stated with definiteness, but it may be conjectured that the high-school pupil, being thrown more on his own resources, has developed habits of greater industry and independence of thought. Probably, too, the high-school group is a more highly selected one for the reason assigned by Colton, namely, that the private school sends out a relatively larger number of duller pupils, though they are more thoroughly drilled in the requirements of college entrance examinations.

The conclusion, that the high-school student, irrespective of his previous training, is superior to other students in biology is confirmed by a study of the grades of the students who prepared at high schools, but who had had no biology previous to entering college. There are 101 of such students in the class of biology and their average work is 286, exactly the same as that of the group who had had previous training in biology. The conclusion is somewhat obscured, however, by the fact that not all of the latter group prepared at high schools. So far as the office records show, 16 of the 73 received their preparation for college in private schools exclusively, 28 in both high and private schools, and 29 in high schools exclusively. The basis of selection in this group, therefore, while mainly the same as that of the high-school group without previous training in biology, is in part of a different character, the exact nature of which necessarily remains obscure.

Finally, it may be pointed out that the conclusion drawn by Colton "that it is more advantageous for a student in the general course at the University of Pennsylvania to have had some biology in school" is scarcely warranted by the data he presents in his article. It is true that in the case of one group—those who have prepared at the Philadelphia high schools—the students who have had zoology previously do better in the college course in that subject than those who have had no such previous training. But for the group coming from other high schools this is not true, since they do no better than those coming from private schools without previous training in zoology. Again, even in the case of the Philadelphia high-school pupils, it may be, so far as the data show, that the group with previous training in zoology is a group similar to our own, that is, one having a greater capacity for mark-getting in general. Granting, however, that it can be shown conclusively that this group is superior because of the former training in zoology, it may be questioned whether such a group of students should be placed in an elementary class in college designed for the most part for those who have had no such training. A comparison of the content and methods of courses in high school and college might show that the college course in large measure is a duplicate of the high-school course, and consequently one or the

other is practically a waste of time. The question is not simply whether previous training leads to greater capacity for mark getting, but rather whether this advantage is sufficiently great to make up for the loss of some other possible course which might have been taken instead of the zoology.

E. H. CAMERON
YALE UNIVERSITY

THE PUBLIC LIBRARY AS AN INDEX TO CULTURE

TO THE EDITOR OF SCHOOL AND SOCIETY: May I be allowed a note on Scott Nearing's article on "The Public Library as an Index of Culture" in SCHOOL AND SOCIETY for December 30, 1916?

The library statistics in the Educational Directory, U. S. Bureau of Education, 1915, No. 43, are somewhat misleading unless they be regarded as a supplement to those given in bulletin No. 25 of the same year. In the latter bulletin the statement is made that only libraries of 5,000 volumes or over are included. That fact should certainly have been made clear in connection with Table III., p. 982; otherwise the figures quoted give a quite distorted view of the facts.

Whatever the value that may be attached to such a study as Mr. Nearing has here made, and he does not seem quite certain himself of its value, there can I think be no question that the value would be greatly increased had he used tables giving all the public libraries, not one limited to libraries of over 5,000 volumes. For the usefulness of the public library is proportioned to the need; in old communities with large public libraries there are also large private libraries and, very generally, many private libraries, whereas in the new communities where public libraries are small, there are also few private libraries and those few are likely to be small. The civilizing influence therefore of the public library must surely be greater, relatively speaking, in communities served by small libraries.

Furthermore to use the limited statistics must be unfair to the newer states. It is evident that, in Massachusetts, for example, many a small town has been building a library for fifty years and has among its accumulations a great deal of what may be called junk, at least is without influence upon its readers. The newer libraries in small towns in South Dakota, for example, contain very little that is not in constant circulation, very few books given away because the owners could find no use for them, very few accumulations of a bygone taste. That is, a town in South Dakota with a library of 2,000 volumes is perhaps quite as well supplied with usable reading matter as many Massachusetts towns with 5,000 volumes. The tables therefore would have been a better index to actual conditions had they been based on all public libraries.

Still more useful for Mr. Nearing's purpose would have been tables based upon total circulation. Such tables should however be supplemented by the circulation of traveling libraries.

Mr. Nearing's study is more interesting as basis of expectation for the future than as supplying a cause for the past. Library growth outside of New England and a very few other regions is a thing so recent that as an influence moulding leadership, outside of New England, I mean the active leadership of today, it is negligible.

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BIOLOGICAL NONSENSE APPLIED TO EDUCATION

MR. CASPAR REDFIELD, a lawyer of Chicago, has queer theories concerning heredity, which he has been exploiting in the *Journal of Education*. Mr. Redfield says:

> Educating the grandfather helps to make the grandson a superior person. . . . We are, in our inheritance, exactly what our ancestors made us by the work they performed before reproducing. Whether our descendants are to be better or worse than we are will depend upon the amount and kind of work we do before we produce them.

In the issue for December 28 an editorial note remarks:

> We are using this week a third article by Casper L. Redfield, of Chicago. We regard these articles as highly significant in their presentation from an entirely new angle of a most important phase of the latest thought regarding inheritance

and education. Whoever has failed to read all of these articles with great care has missed much that every educator should study with close attention.

Mr. Redfield's biological views do not matter. The unfortunate aspect is that he may succeed in persuading people ignorant of biology that they should marry late and not have children until they are old, because children born under these circumstances are said to be superior, owing to the alleged circumstance that they inherit the education and experience of their parents. It is a pity that such foolish and pernicious theories should be given publicity and endorsement in a widely circulated journal of education. C.

QUOTATIONS

EDUCATION AND THE BRITISH GOVERNMENT

Judicious minds will admit that one of the roots of our troubles before and during the war has been our extremely defective system of education. About one hundred years ago a distinguished schoolmaster succeeded in establishing the legend that the chief, almost the sole, business of schools and colleges is "moulding character," and that developing the intellect and cultivating a passion for scientific truth and knowledge are a very secondary affair. Our rulers since that day, with few exceptions, have been trained in obedience to that device. This has expressed itself in two ways: Education controversy and education bills have been mainly concerned with conflicts of jurisdiction between the sects, because what is called religious teaching is presumed to be intimately associated with moulding character, and education ministers have been, with few exceptions, second-rate politicians, or men without any interest in education or men who regarded their office as a tedious waiting-room to another and really important department. Liberals have to confess with shame that this neglect of education has been as notable in the last eleven years as in any previous period. Their return to power was marked by a raging battle between the sects in which education was lost sight of, and when it subsided the education office passed into hands notoriously indifferent or incompetent, until finally it became the title by virtue of which a minister drew a salary for busying himself with something wholly unrelated to education. Meanwhile, the new secondary schools which Mr. Balfour's act made possible were being established, under the auspices of weary and unimaginative officials trained in the public schools to be pale reflections of the public schools, themselves in dire need of reform. Such is English education as Mr. Lloyd George has found it. How will he leave it? That is one of the tests of his quality, for English statesmanship is master in this field if it wills, and can act here without heed to enemy or ally. He has begun well by departing from the evil practise which made this sacred charge the reward of secondary party service. The new president of the board of education, Mr. H. A. L. Fisher, is a distinguished scholar, a man who has taught in universities and directed universities. More than all these, he is a man of free and liberal understanding who appreciates the importance of education and knows where the true center of gravity in education lies. It is a vast task that lies before him, this breaking with the bad but deeply rooted system of a century; but just as the need was never more bitter than now, so the English people have never been more ready for a radical change.—*The Manchester Guardian.*

BOOKS AND LITERATURE

Sex-Education, a Series of Lectures concerning Knowledge of Sex in its relation to Human Life. By Maurice A. Bigelow. The Macmillan Company, 1916.

This volume is a discussion of the educational aspects of the sex problem and only incidentally of sex *sui generis*. Its author has taken an active part in the movement for a rational enlightenment in these matters and the book is an outcome of his work as a teacher of prospective teachers of biology. Its clear presentation, convincing arguments and excellent temper make it a valuable contribution to a vexed subject which has often suffered more from its advocates than from its critics.

In his introductory chapter, Professor Bigelow discusses the "Meaning, Need and Scope of Sex-Education," defining it as including "all scientific, ethical, social and religious instruction and influence which directly and indirectly may help young people to prepare to solve for themselves the problems of sex that inevitably come in some form into the life of every normal human individual." Emphasis is laid upon sex-education as far more comprehensive than sex-hygiene, which was the term originally applied to such instruction, and it is pointed out that the terms "sex-hygiene" and "social-hygiene" imply too restricted a view of the educational need. Nor is the use of the term "reproduction" as synonymous with "sex" justifiable either on biological grounds or as a word which conveys the proper meaning, for though reproduction is the culmination of sexual phenomena in animal life, our human problems of sex have often no direct connection with the production of new life. The use of the word sex is defended as conveying the proper idea and there seems no reason why dignified and proper usage should not remove the terms "sex" and "sexual" from the vulgarity with which they are associated in the minds of many individuals. As a matter of fact, the word "love" has had far more degrading usage in literature than has the word sex. The plea is made for a larger view of sex as a great factor in life which, on the one hand, is joined to the processes whereby the race continues to exist and, on the other, to psychic and esthetic states which we recognize as indissolubly united with that which is best in our nature. For such an understanding of sex only the science of biology offers an adequate foundation. The old policy of silence is discussed and charged with failure, for children do not remain ignorant, and the real choice which parents must make is not between ignorance and knowledge, but between sources of knowledge. Intelligence and not a so-called instinct should control our diversified sexual acts in later life, and hence knowledge is necessary. If these contentions be sound, what so natural as that we should turn to organized education as one of the means by which this knowledge may be imparted. The author's viewpoint in his discussion of the scope and nature of this education is comprehensive, maintaining as he does that the instruction can not be limited to school and colleges, but that other agencies, such as the Y. M. C. A., the Y. W. C. A., the Boy Scouts and the like should play a part. Recognizing the impossibility of such instruction in most homes, he nevertheless takes no radical stand for its introduction into the school; certainly it should not have a place by itself, nor be in any way unduly emphasized, though many things should increasingly contribute toward this end as the child grows to maturity. It is hard to believe that the good sense and caution expressed in the suggestions regarding the introduction of sex-instruction in the schools can arouse opposition in many quarters. The author realizes that we are at the beginning of this matter, but looks forward to that which may ultimately come to pass in a program of adequate instruction along these lines. One point which he emphasizes in the conclusion of his chapter has only just come to be realized, namely: that sex-instruction in the post-adolescent period is necessary, not only with a view to continence in men and chastity in women, but also to the end that happy and monogamic marriage may be attained.

Discussing the "Problems for Sex-Education" in Chapter II., the author contends that at the present day we need not more knowledge of sex nor more arguments for sex-education but a wider dissemination among parents and educators of what is already known and of the arguments which have already been convincingly stated, and, indeed, the entire volume presents such an argument with references to sources of detailed information. The problems of (1) personal sex-hygiene, (2) the social diseases, (3) the social evil, (4) illegitimacy, (5) sexual immorality, (6) sexual vulgarity, (7) sexual problems and marriage, and (8) eugenics, are of such importance that any one of them is worthy the attention of educators. The urgency of these problems is discussed on pages 35–88, and we note the high idealism in the plea for a super morality on the part of the world's best men and women

and the caution against imparting information regarding immorality in place of constructive suggestion which may lead young people to the emulation of a high example rather than to curiosity regarding debasing activities.

Under the head of "Organization of Educational Attack on the Sex Problems," we are told, in Chapter III., that we pursue an advancing ideal, though it will be long before we can hope to reach even that part of our ideal which is now clearly defined, for "the task of sex-education is the ever-advancing improvement of sexual conditions in individual as well as social life." Despite the commanding importance of the social evil and its diseases, it is insisted that in the long run other considerations of an ethical, hygienic or esthetic nature are of more importance to humanity; for they represent constructive effort in contrast to destruction or prevention. The educational aims of sex education are grouped as follows: "(1) the development of an open-minded, serious, scientific and respectful attitude towards all problems of human life which relate to sex and reproduction; (2) the imparting of such knowledge of the personal hygiene of the sexual organs as is necessary to health; (3) the cultivation of an ethical and social conscience in matters of sex; (4) to teach *briefly* to young people during later adolescence, the essential hygienic, social and eugenic facts regarding the two destructive diseases which are chargeable to sexual promiscuity." These aims are arranged in the order of their importance as viewed by the author. In the remainder of the chapter the discussion is upon the mode of educational attack.

Under the heading "The Teacher of Sex-Knowledge," Chapter IV. insists upon the personality of the teacher who shall handle those personal and human aspects of the instruction which should crown the biological studies of the earlier years. The question of the sex and age of the teacher, of coeducational classes, of married women as teachers, of mothers as first teachers and as teachers of adolescent boys are briefly discussed and cautions given regarding certain teachers who are undesirable. No instruction at all is preferable to that from unsatisfactory teachers. All this is so clearly stated and in such admirable temper that much opposition will be disarmed at the outset. The chapter (V.) on "Books as Teachers Concerning Sex and Life," taken with the literature list at the close of the volume, will serve as an excellent guide to parents and teachers who desire the necessary information for themselves or who wish to place literature of this nature in the hands of others. Chapter VI. on "Sex-instruction for Pre-adolescent Years" develops still further the mode of educational attack. Here the differentiation in the instruction of boys and girls is made clear and there is much helpful suggestion for the parent. Chapters VII., VIII. and IX. continue with suggestions as to the educational attack during early adolescence and in young manhood and young womanhood and here again we find the spirit of a fine idealism and a note of constructive effort which shall not only banish evil, but rather overcome evil with good. Dancing and women's dress are here cited as effecting self-control in young men and also the young woman's attitude toward love and marriage, and there is throughout a recognition of the difference of the problem in the two sexes.

The succeeding Chapter X. is a reply to certain prominent critics of sex-education, notably Agnes Repplier, Cosmo Hamilton, Richard Cabot, Superintendent Maxwell and Ex-president Taft. It is pointed out that some of this criticism, though recent, attacks the program of sex-education as originally conceived or as it has suffered through its extreme and unbalanced advocates. It must be remembered that much crystallization of opinion has occurred even in the ten years since this movement took its origin, and a good deal of progress has been made toward a more unified opinion together with the elimination of many extreme views. Nor is it fair to charge the sex-education movement with the recent capitalization of sex by the producers of theatrical performances and the writers of novels, who have, we hope, seen their most profitable days. Where the argument lies squarely across the path of his present ideals, Professor Bigelow

meets it fairly and it is hard for a biologist, at least, to feel that he does not refute these critics. A good example of this is found on page 209 in the simple and adequate reply to a criticism of the biological approach which comes from a religious source and which, to the biologist, has an element of childishness which might easily provoke a rather caustic rejoinder and some comment as to why such an aspect of religion as is here illustrated will never again appeal to thinking men. While they have not the force of a stinging blow as had Huxley's reply to Bishop Wilberforce, there is a bit of the same element in the two quiet sentences with which our author dismisses the plea of Cosmo Hamilton.

The two concluding chapters (XI. and XII.) deal, respectively, with the "Past and the Future of the Sex-Education Movement" and with "Books for Sex-Education." That the movement is not an educational fad, destined to go its way with many others, seems borne out by the vital need of some solution better than that we now possess for a problem which confronts every one of us. That part of the Chapter XI. which is now history is interesting as showing the rapid shifting of the ideal from the limited field of the social diseases to a broader and nobler conception. The list of reference books which follows is extensive but by no means, as the author states, complete, and his comments will be helpful to teachers and parents who are in sympathy with this educational movement and have need of its literature.

Taken as a whole, the book can be recommended as the only compact and comprehensive discussion yet published of a side of this matter which parents and teachers ought to know. It is written in the simple and unemotional manner in which these matters above all others should be discussed, and one can not but admire the high-mindedness of the writer which shows itself despite the impersonal nature of the discussion. The book breathes throughout a spirit of high and matured idealism such as those who experienced his companionship in earlier years might well have believed Maurice Bigelow capable of in middle life, and the fact that all royalties are to be devoted to the movement for sex-education is but a part of this idealism.

It is very hard for a biologist to believe that the movement for a better solution of sex problems through education will not make its way, though those who advocate it should hope that it may make haste slowly and not suffer too much at the hands of its friends. As Professor Bigelow points out at one place, we have already in the curricula of our schools nine tenths of the actual subject-matter which needs to be taught since the sex problem is so generalized and so largely biological. We do not need special sex instruction organized *de novo*, we rather need biological work wherever it is lacking, and as the keystone of the arch an effective handling of the problem of human sex by methods that have yet to be developed. Why should we be afraid to try? We have nothing which binds us to the present method, for if such a program as Professor Bigelow suggests had been tried and had yielded the fruits borne by the method of silence would it not be the most ghastly educational failure of the ages?

WINTERTON C. CURTIS

REPORT OF THE COMMITTEE ON GEOMETRY[1]

DURING recent years we have heard much criticism of the type of intellectual work demanded in the high schools, particularly in mathematics. Geometry has not failed to receive some of the unfavorable comment. This dissatisfaction with the existing courses in mathematics has resulted in a number of reform proposals. However, owing to the difficulties in overcoming tradition most of these suggestions are receiving little consideration.

One reform, advocated frequently, is the introduction of the most concrete subject, geometry, before taking up the other mathematical subjects, *e. g.*, algebra, with the understanding that geometry is to be used as a concrete basis for the study of all other branches of secondary mathematics.

[1] Read before the Central Association of Science and Mathematics Teachers, Chicago, December 1, 1916.

The high-school age is the time for emphasizing the logical phase of geometry. This fact and the desire to prepare for college probably are the principal reasons for the arrangement of the subject-matter as we now find it in most of our text-books and which is still essentially the same as given by Euclid. Without question it is a marvel as a logical system. However, as an introductory course, this type of geometry is extremely difficult for the ordinary high-school student. Hence, it is important that before taking up the study of logical geometry a *well-directed* and *systematic effort* be made to teach first the simple concepts of geometry.

This fact has been recognized to the extent that in nearly all text-books on geometry we now find some introductory work for the purpose of developing the fundamental notions of geometry, and of creating a feeling on the part of the student not only of the need of a logical proof, but of its usefulness and advantages over the intuitional or experimental methods of establishing geometric truths.

Although this is a step in the right direction, a short introductory course of two or three weeks in which a large number of new notions are introduced in quick succession, to be used almost immediately in correct logical demonstrations, is not at all satisfactory Even with this introductory course a large number of students fail to enter into the spirit of the deductive geometry during the first months of study in the subject. Indeed, this is inevitable. For such a course overlooks the absolute necessity of time exposure required to make the learner familiar with the tools he is to use later and to make him pass gradually, almost unnoticeably, through the stages of intuition, observation, description, experimentation and informal discussion to the deductive method of geometry. Hence, this introductory work should begin even before the pupil enters the high school. There is no reason why systematic instruction in geometry should not be given as early as in the fourth grade, if the proper methods of instruction are used. Where cooperation between the elementary and the high schools is impossible, much of the introductory work should be done in the first high-school year, demonstrative geometry being left for the second year. Unless this is done, geometry will continue to be one of the most difficult subjects offered by the high school.

The following is suggested as an outline of a course in geometry, beginning in the elementary school and continuing in the high school.

All geometric development starts with observation. Therefore, this should be the first stage in the introductory work. Space study teaches at first knowledge of the simplest space forms, in particular typical angles, figures and solids, and instruction should aim at a well-classified and conscious observation. Through constant instruction in observing the pupil trains his eye to estimate magnitudes of lines and angles, to judge lines and planes as to their horizontal or vertical position, etc. The eye is very sensitive to certain fundamental forms, as perpendicular and parallel lines, parallelograms, and regular polygons and solids. Perhaps this is because they are met frequently in nature, the whole orientation in space depending upon a clear conception of parallel and perpendicular lines and planes in space. Intersecting edges lead to the development of the notion of angle and to classifying angles according to sizes, especially right angles.

The objects used in this work are the cube, cylinder, cone and sphere.

Along with observation the scientific language of geometry is taught. The pupil learns to describe in correct language the fundamental forms of the plane and space as viewed on models and objects around him. Conversely, from a given description he learns to imagine these forms correctly. Thus, he conceives and systematizes space magnitudes. Inspection of the boundary of surfaces leads to the explanation of the simplest geometric figures. Through the study of pyramids and prisms he learns to classify triangles and quadrilaterals and the main positions of lines and planes in space. From the cylinder, cone and sphere he obtains the circle.

Drawing is a most useful means of connecting new and old ideas and of making them the property of the pupil. Forming figures with

simple helps, as sticks and cardboard, impresses upon the memory the mutual positions of lines and planes in space. Pupils quickly attain the ability to test lines and planes in space as to horizontal and vertical positions, to notice errors in free-hand drawing of parallel lines, right angles and squares. Soon they are able themselves to model or draw these fundamental forms. Hence, in connection with every exercise, observation is to be followed by drawing. Drawings are tested with the triangle and cube. Then the teacher demonstrates how to use drawing instruments. The pupils learn to draw on paper various kinds of geometric forms with the use of these instruments, and develop skill in the handling of the straight edge, compasses, ruler, protractor and triangle. They learn to construct parallel lines and perpendicular lines, *e. g.*, the altitudes of a triangle.

Plane and solid geometry should be closely related. With the study of the cube, relative positions of straight lines in a *plane* as well as in *space* are studied, *i. e.*, intersecting, parallel and perpendicular lines.

The following models and instruments are needed in this work.

A cube whose edge is at least 10 cm.

Compasses, ruler and protractor.

Cardboard and books for generating diedral angles.

Wooden triangles, polygons, circles and sectors of circles.

Pyramids and prisms, especially regular, with bases having three, six and eight sides and about 30 cm. high, frustums of pyramids, circular cylinders and cones.

Sphere, hemisphere, segments and sectors of a sphere.

At the end of this course the following terms should be known to the pupil: cube, rectangle, square, surface, edge, corner, straight line, point. Prism, sphere, circle, center, diameter, radius, distance, straight line, right angle, perpendicular, straight angle, oblique angle, right triangle, equilateral triangle, isosceles triangle, obtuse triangle, parallel lines and planes, complements and supplements.

The pupil should know the following symbols: $=$, $<$, $>$, $\perp$, rt. $\angle$ and st. $\angle$.

He should also know the formulas giving the surface measure of the square, rectangle, cube and rectangular prism, and the facts that $A + B + C = 180°$ for any triangle and $A = B = C = 60°$ for the equilateral triangle.

This work may be given in the sixth grade or earlier. It represents the first stage in instruction in geometry.

So far the *manual use* of ruler, compasses and protractor has been a prominent feature. Now the pupil learns *the use of geometric ideas and concepts*, as symmetry, congruence and similarity.

Symmetry of form can be observed anywhere, as in furniture, decoration, etc. In fact, few things are not symmetrical. The plane of symmetry is illustrated on various objects, *e. g.*, the head. From this the pupil passes to the study of symmetry *in the plane* and of the axis of symmetry. He acquires a working conception of these terms in a purely inductive manner. He does *not* learn a *scientific definition* of the terms. For example, he learns that folding a paper with an ink spot makes another ink spot symmetric to the first with reference to the crease in the paper.

The *fundamental constructions* are then taken up, based on symmetry, as the bisection of an angle and the erection of perpendicular lines. All this is done without going into logic, but emphasizing accuracy and teaching pupils how to make as exact constructions as it is possible for them to form.

The symmetry of the isosceles and equilateral triangle; the drawing of the medians, bisectors of angles of a triangle, etc., gives pupils an opportunity to recognize general geometric facts. Thus all pupils, each with a different-shaped triangle, find that the bisectors of the angles of a triangle are concurrent. This leads them to raise the question whether it is possible to "prove" that the concurrence of those lines is a general fact.

The symmetric properties of solids, as the cube, square, pyramid, etc., are studied.

Symmetry of the circle leads to the problem of locating the center and of constructing regular inscribed and circumscribed polygons.

Thus far figures have been studied as a

whole, now they are analyzed and put together, leading to the construction of geometric forms. This activity requires attentive observation of form and calls for application of previously acquired knowledge. The pupil learns to recognize a sufficient number of parts which determine a figure and to construct congruent figures.

Actual measurement in the classroom, building and school yard furnish figures to be constructed and drawn to scale. Some of the fundamental problems of finding inaccessible distances are solved by that method.

The following models, made of wood, cardboard or wire, are used in this work: a cube, a quadrangular prism and pyramid, divided into symmetric parts by planes; a sphere with the equator marked and parallel circles and meridians; right and oblique pyramids, prisms, cones and cylinders; the five regular polyedrons.

At the end of this course the pupil should be familiar with the following:

Measurement and graphing of line-segments;
Measurement of angles;
Relations between the angles of a triangle, interior and exterior;
Relations between adjacent angles, complementary and supplementary;
Relations between the acute angles of a right triangle;
Relations between the angles formed by parallel lines and a transversal;
Problems solved by scale drawings;
The fundamental constructions, and constructions of congruent figures;
Properties of chords, tangents and central angles; of the isosceles and equilateral triangle.

Correlation of Algebra and Arithmetic with Geometry.—Opportunity for the study of algebra and arithmetic is found in adding, subtracting and multiplying line-segments; in measuring lengths, as perimeters and circles; in finding areas and volumes. Expressions like $(a+b)^2$, $(a+b)(a-b)$, $(a+b)^3$ are pictured with rectangles and cubes. The formula $S=ba$ is developed for whole numbers, decimal fractions and fractions. Computation of areas leads to square root. Here the pupil learns to understand the advantage of approximate arithmetic, as he develops his judgment as to the limited accuracy of the magnitudes given and to be computed.

This concludes the second stage in the introductory work in geometry. It may be given in the sixth or seventh grade.

Transition to Logical Geometry.—The need of a lengthy period for making the transition to logical geometry is not always recognized. This neglect is one of the principal causes for loss of delight and pleasure which should come to every student of geometry.

Pupils should *prove* geometric facts long before they learn to *demonstrate*. At first the properties of figures are studied and the results found are formulated as theorems. The truth of these theorems is then established by reasoning. However, at this stage the *method of proof is always informal* and rigor is carried only as far as the class is able to appreciate it. Thus, after it has been found that two lines perpendicular to the same line are parallel, the student will reason about as follows: "This must be true. For, if they were *not* parallel they would meet and then we would have two lines from a point outside of a given line perpendicular to the given line, which is impossible." However, the conventional form of proof: given, to prove, proof might be used occasionally in instances in which the class can appreciate its value.

In the study of geometry at this stage it is aimed (1) to establish geometric facts, either by studying the figure, or as a consequence of other known facts; (2) to help the student to pass gradually to the logical method of demonstrative geometry.

The following topics are studied:

Congruence of triangles.
Similarity of figures.
The properties of isosceles and equilateral triangles.
Proofs of the fundamental constructions.
Tangents and regular inscribed and circumscribed polygons.
The theorem of Pythagoras.

The method used is illustrated in the following two examples:

1. *Congruence of Triangles.*—Each student

in the class constructs a triangle satisfying given conditions. These triangles are cut out and placed one over the other. Making allowance for inaccuracies in the constructions, it becomes evident that the triangles coincide. This fact is then formulated as a theorem. Next it is to be *reasoned* out that *any* two triangles satisfying the given conditions can be made to coincide. For this two large wooden triangles are used, the teacher showing that part after part of the triangles can be made to fit until the triangles coincide throughout. Finally, two triangles ABC and $A'B'C'$ are drawn on the blackboard. They represent any two triangles satisfying the given conditions and the corresponding parts are marked. It is now *imagined* that one triangle be placed over the other and it is shown that they can be made to coincide.

2. *Similar Figures.*—The study of similar figures which was begun in preceding course is continued, but does not yet take the form of a strictly logical discussion of the subject. Attention is called to the similarity of a map and the piece of land it represents, to the fact that all squares, equilateral triangles and circles are similar, but not all rectangles and isosceles triangles. In the preceding course the *properties* of similar figures were found by measuring and drawing. Now the *changes* of similar figures are studied as based upon formulas of perimeters and areas. This gives opportunity for comparing corresponding changes in length and surface, *e. g.*,

$$S = \frac{a^2}{4}\sqrt{3} = (.433\cdots)a^2$$

for the equilateral triangle, $S = 1 \cdot a^2$ and $p = 4a$ for the square, $S = \pi \cdot r^2$ and $p = (2\pi)r$ for the circle. A most interesting illustration is the change in the volume of a sphere as the radius changes. That a sphere of cork with radius equal to 1 meter weighs over 2,000 lbs. is a surprise to most pupils but is easily verified.

This work represents the third stage in the introductory work in geometry. It may be given in the eighth grade or in the first year in the high school. About half of the time usually given to mathematics should be devoted to the study of geometry, using the remainder for the other mathematical subjects.

Logical Geometry.—In the preceding courses the student has gained a thorough understanding of the fundamental concepts of geometry. He has seen the need of a logical proof and its advantages over the experimental method. He now learns to choose between *various methods* of proof. These methods are discussed and emphasized throughout the whole course, leading the student to see that there is usually some definite plan he may follow and that it is not a matter of chance or stumbling upon a proof.

The following types of proof are predominant:

1. Proof by superposition: One figure is placed over another and it is shown that all parts of one coincide with the corresponding parts of the other. This method is used mainly in proving the *fundamental* theorems of a chapter.

2. The method of congruent triangles: Line-segments or angles are shown to be equal by proving that they are corresponding parts of congruent triangles.

3. The indirect method: A powerful method of proof used not only in geometry, but in every-day life. From assuming the negative of the conclusion of the theorem in question, the student is led to a statement contradictory to known, or assumed, facts. Hence, he concludes that the assumption is wrong and the conclusion is true.

4. The method of analysis: By means of an analysis the student discovers the known fact from which to start and learns how to arrange the proof.

In the proof of converse theorems, methods (3) and (4) are generally used.

5. The algebraic method: Relations between magnitudes are expressed in symbols. The required magnitude is then found by a process of elimination.

The inductive method is used to *discover* mathematical facts by considering enough special cases to enable the student to recognize the general law underlying these cases.

Arrangement of the Subject-matter.—The

custom of dividing the subject of geometry into a few books is only of traditional importance. This arrangement carries the student alternately from very simple to the most difficult subject-matter. It is not a psychological arrangement and therefore not economical of the student's time and energy. It is better to divide the course into a number of short chapters, each dealing with one or only a few central topics. This may be done in various ways. The following is suggested as a tentative arrangement:[2]

1. Quadrilaterals. Parallelograms, angles formed by parallel lines and a transversal, the trapezoid, the kite.

2. Proportional line-segments. Parallel lines cut by transversals, constructions leading to proportional segments, processes which applied to proportions give proportions.

3. Similar polygons and triangles.

4. The theorem of Pythagoras and its generalizations.

5. The circle. Diameters, chords and arcs, parallel secants, tangent circles.

6. Measurement of angles by arcs of the circle. Inscribed angles, angles formed by secants, tangents and chords.

7. Proportional line-segments in circles.

8. Inequalities. In the preceding chapters various theorems on inequalities have been proved. This chapter is an extension and full treatment of the subject.

9. Loci and concurrent lines. Before this several locus theorems have been proved. This chapter is a summary and extension of the subject. The same is true for the next three topics.

10. Regular polygons inscribed in, and circumscribed about, the circle. Length of the circle.

11. Area of the triangle.

12. Area of the polygon and circle.

Trigonometry.—Most text-books on geometry now contain the fundamentals of trigonometry, consisting mainly of the definitions of the trigonometric ratios, finding the approximate values of the ratios for given angles, the use of tables of the natural functions and applications to the solution of the right triangles. This is usually given in connection with the study of ratio, proportion and similar triangles. After that as a rule no further use is made of this new and valuable tool. Hence, it is soon forgotten by the student, with the result that it can not be assumed as known when he takes up the study of trigonometry as a subject. It is a distinct educational loss that trigonometry should not be used more in the study of geometry. Trigonometric methods should replace geometric methods where a real advantage is involved. Thus, a number of theorems may be proved trigonometrically, *e. g.*, the formulas giving the area of a triangle in terms of two sides and the included angle, the area of the equilateral triangle, the area of the inscribed triangle in terms of the sides and the radius of the circumscribed circle, the relations between the sides, and area, of regular inscribed and circumscribed polygons and the radius of the circle, the evaluation of π, etc.

Solid Geometry.—The separation of solid geometry from plane geometry is unfortunate. In the preceding courses early training in the promotion of space conception has been afforded. Similarly a real advance in solid geometry should be made during the study of plane geometry. For, many theorems of solid geometry are closely related to the corresponding theorems in plane geometry. If they are proved in this course the student will have appropriate exercise in both two- and three-dimensional thinking. The work in solid geometry should include the theorems on diedral angles; perpendicular and parallel planes; theorems on lines and planes in space; some study of the sphere, and circles on the surface of the sphere. This leaves for a later period the study of areas of surfaces, volumes of solids, and polyedral angles in connection with spherical polygons.

Usefulness of Geometry.—It is desirable to impress upon the pupil the importance and significance of geometrical facts in the affairs of every-day life.

[2] See article on "Secondary Mathematics in the University High School," by E. R. Breslich, *School Review*, November, 1916.

Limits.—The question of incommensurable lines should be raised. The notion of the limit as a constant approached by a sequence of numbers should be developed but no topical treatment of limits be given.

A treatment of geometry as outlined above, extending over a period of two or more years, preferably beginning in the elementary school, will go far to remove the great difficulties met by the students in the traditional course. Consequently it will remove much adverse criticism, justified to some extent, of the one-year course in plane geometry as it is now given in most high schools. If the selection of the material to be used in the grades is justified, it should be worth while to give it a trial in some schools. If any of it turns out to be too complicated or otherwise undesirable we shall have to be openminded and ready to revise.

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EDUCATIONAL RESEARCH AND STATISTICS

THE ESTIMATED VALUE OF SCHOOL STUDIES

THE organization of school courses depends fundamentally upon the real or supposed values which are attached to the various subjects that make up the course. History or science or any branch of learning is given the particular place it has, either in being made compulsory or elective or in the time and facilities devoted to it, because of the values of whatever sort that are ascribed to it.

The values of school studies are at the present time primarily matters of personal judgment rather than matters of objective evaluations or quantitative measurements. These ascribed values, even when made with the most thoughtful scrutiny, are quite certain to be erroneous and to differ very decidedly from the real values. This is indicated in the few isolated instances in which the real value has been measured in part at least by experimental methods. For example, the advantage in learning a new language from having learned another language previously is greatly overestimated both by students and teachers of language alike. Swift[1] found that the disadvantage in beginning a new language on the part of those pupils who had not studied other languages before was relatively small and practically disappeared after the first fifteen weeks of study of the new language. Likewise the training of reasoning in general through the study of mathematics or the facilitation in the use of English through the study of other languages is quite surely overestimated.

The only guide, nevertheless, lies at the present time in the judgments about these matters by teachers, administrators and others interested in the public schools. In view of this situation, it seemed worth while to obtain a combination of judgments concerning the values of school studies, even though these may not represent their actual or ultimate values. In any event, the consensus of judgments of many competent persons will be better than the single opinion of one individual.

Any branch of learning may have three possible values—a disciplinary value, a utility value and a cultural value. Thus the study of English has a certain amount of disciplinary value in training the mental capacities involved in the learning and understanding of the material studied; it has an obvious utility value in acquiring the ability to use English correctly and effectively; and it has a certain cultural value in acquainting the student with the thought and life of mankind.

Estimates of the three values of each of the subjects listed in the table were made as carefully as possible by fifty-eight superintendents, principals and teachers.[2] In making these estimates it was assumed that the pure, disciplinary value of the first year of high-school English as taught in the average way be equal to 10 and that all other values be estimated in terms of this assumption. If the disciplinary value of algebra was considered to be twice as great as that of English, hour for

[1] Swift, E. J., "The Mind in the Making," p. 244.

[2] Students in the writer's course in educational measurements in the summer session of 1916.

hour devoted to each, then it should be estimated as 20. Or if the utility or cultural value of English was considered greater or less than its disciplinary value, the rating should be indicated accordingly. It was further assumed that these were to be the values for the average boy or girl in the high school.

At first glance it would seem that such judgments would be rather uncertain and variable, and as a matter of fact they are quite variable. Nevertheless, viewed from the statistical standpoint, the judgments present a normal distribution spreading over a wide range but clinging in large numbers about a central point. For example, the judgments of the disciplinary value of United States history ranged as extremes from 3 to 30, with the largest number of estimates on 10 and a gradual decrease in the number of estimates on values farther and farther removed from 10. The median estimate was 10 and the probable error was 3.5, that is, one half of the estimates were between 8 and 15. So that the judgments about the various values, even though quite variable and usually accompanied by a feeling of uncertainty so far as the individual judge was concerned, are as reliable and as normal as judgments about most matters are.

The following table gives the median judgment for each of the values listed.

An examination of the table reveals some interesting comparisons. The highest disciplinary value is assigned to geometry with a rating of 20, or twice as high as that of English. Algebra is next with a value of 19. It is rather surprising to find gymnastics and football rated as high as they are. It is also interesting to note that the disciplinary value of a pupil's earning his way through school is rated higher than that of any of his studies. The lowest disciplinary value is assigned to sewing and typewriting.

In the case of utility values, the highest rating is given to English, cooking and sewing (30), a value approximately three times as great as their disciplinary value. The lowest utility value is assigned to football (6) and next to algebra (9). Again the utility value of a pupil's earning his way through school (36) is placed above that of any of his studies.

In the case of cultural values, the highest rating is given to music (25) and next to English (22). The lowest value is assigned to shorthand, typewriting and football (5). The cultural value of a pupil's earning his way through school (18) is placed below only music and English.

	Disciplinary Value	Utility Value	Cultural Value	Totals
Geometry	20	10	8	38
Algebra	19	9	8	36
Latin	17	10	14	41
Physics	17	18	12	47
Gymnastics	17	12	7	36
German	15	15	12	42
French	13	11	13	37
Chemistry	13	19	11	43
Manual training	12	23	10	45
Football	12	6	5	23
Shorthand	11	21	5	37
English	10 (assumed)	30	22	62
U. S. history	10	18	17	45
Physical geography	10	15	10	35
Music	10	11	25	46
Cooking	10	30	9	49
Bookkeeping	10	25	7	42
Civics	10	21	12	43
Botany	10	12	11	33
Zoology	10	11	11	32
Drawing	10	11	15	36
Sewing	9	30	10	49
Typewriting	9	22	5	36
Work of teacher or business man	22	33	18	73
Earning one's way through school	24	36	18	78

Thorndike[3] found in a study of similar nature but confined to college subjects and only to their disciplinary aspect, the same general results for those studies found in both high school and college. Mathematics, Latin and Greek were placed at the top of the list with a rating of 16 as compared with freshman English (10).

In conclusion we may note that while the results here presented are not ultimate or absolute evaluations, they nevertheless represent an interesting assemblage of competent judgments and are more reliable than any individual beliefs would be on which our practises are usually based.

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[3] Thorndike, E. L., *Education*, January, 1915, p. 278.